

MEMORANDUM

TO: Planning and Zoning Commission

FROM: Jeremy Ginsberg

SUBJECT: Proposals to amend the Darien Subdivision Regulations
and the Darien Zoning Regulations

DATE: December 19, 2008

These proposals to amend the Subdivision Regulations and the Zoning Regulations are put forth by the Planning and Zoning Commission consistent with the October 24, 2008 Stormwater Management Report and Draft Regulations.

Proposal to amend the Darien Subdivision Regulations put forth by the Planning & Zoning Commission:

(Additions in bold, deletions in strikeout)

Add to Article IV Section I a new #8 as follows:

- 8. All subdivisions shall comply with the requirements for Stormwater management as outlined within Section 880 et. seq. of the Darien Zoning Regulations.**

The following are amendments to the Zoning Regulations proposed by the Darien Planning & Zoning Commission:

Create a new Section 880 et. seq. The purpose of this is to require storm water management plans for certain projects and applications.

(Additions in bold, deletions in strikeout)

SECTION 880 – STORMWATER MANAGEMENT

Stormwater management is the practice of controlling the discharge of stormwater from a site such that the quantity of flow does not exacerbate downstream flooding conditions, erosion conditions, or result in a cumulative adverse impact on properties proximate to, or downstream from the site, while managing and discharging the stormwater runoff in a manner that mitigates impacts to water quality.

- a. Conformance to Established Standards. Proposed stormwater management plans are to conform to the technical guidance and procedures outlined in the Darien Stormwater Management Manual.**

- b. **Applicability.** Applications for any site meeting one or more of the following criteria shall submit a stormwater management plan conforming with Section 882:
 - 1) construction or reconstruction of 1,000 square feet or more of impervious surface; or
 - 2) Submission of any application is subject to review and action by one or more of the local land use boards (Planning and Zoning Commission, Zoning Board of Appeals, Environmental Protection Commission); or
 - 3) Submission of an application for the demolition and reconstruction or replacement of an existing residential dwelling.
- c. **Impervious Surfaces.** Impervious surface, for the purpose of this section is defined as new driveways and parking areas, structures, patios and equipment pads. Resurfacing of existing driveways, pools, and golf cart paths do not count as impervious surface.
- d. **Emergency Situations.** In order to help alleviate an emergency situation, a local land use board may waive the requirement for a drainage analysis in order to protect the health, safety, and welfare of the public. After the emergency situation ends, the action should be revisited after implementation as soon as practicable for conformance with the stormwater management regulations.
- e. **Exception for Coastal Areas.** If a site is within the coastal area, and does not meet the criteria of subparagraph b(2) of this section, the requirement for a drainage analysis is waived.

881. Basic Components of Stormwater Management Plans

All instances of comparative hydrology shall document no increase in downstream flooding conditions for the 2, 10, 25, 50 and 100 year storms or adverse cumulative impact on downstream property or property proximate to the site as a result of the proposed development.

- a. **Upstream and Downstream Drainage Basin Analysis.** All proposed developments, which are likely to result in a discharge, or significantly increase the flow of an existing discharge into a storm drainage system or watercourse, must identify the upstream tributary drainage area and perform a downstream impact analysis. The downstream analysis shall be carried downstream to the point that the area of the site is 10% or less of the area of the watershed above, and include an assessment of potential cumulative adverse impacts arising from the discharge.
- b. **Nonstructural Drainage Systems.** A stormwater management plan shall utilize non-structural approaches to controlling runoff to the maximum extent practicable, promoting the infiltration of rainfall into the soil and preservation of existing drainage patterns. Infiltration practices shall be placed such that

they do not adversely affect nearby properties, structures, and or wetlands that may be proximate to the site.

- c. **Wetland and Riparian Buffers.** Natural vegetated and riparian buffers shall be preserved, restored, or established to the maximum extent practicable along watercourses and around wetlands.
- d. **Stormwater Runoff Quality.** All stormwater management plans shall include measures to prevent, to the extent practicable, discharge of pollutants from the site through the use of measures that control both the sources and prevent to the extent practicable, transport of pollutants. The pollutants shall be reduced such that 80 percent of the total mass of suspended solids are removed in comparison with the pre-treatment condition. This may be achieved through one or a combination of Stormwater treatment practices, including, but not limited to, filter strips, sediment basins, groundwater recharge, extended detention basins, and gross particle separators. Where the goal of 80 percent cannot be achieved, the applicant shall submit an explanation detailing why this standard cannot be achieved.
- e. **Conveyance System.** Conveyance systems for the proposed project must be analyzed, evaluated, designed, and constructed to accommodate existing upstream and off-site runoff onto a site in addition to the on-site runoff from the proposed development. The local land use board shall have the discretion to require that conveyance systems be properly sized to address potential adverse impacts.
- f. **Outlet Locations.** The runoff from proposed development sites should utilize existing outlets to the maximum extent practicable, unless it is demonstrated that using the existing outlet would exacerbate downstream flooding or result in adverse impacts to downstream properties or properties proximate to the site. Where new outlets are proposed, they shall be located at natural watercourses, wetlands, or manmade drainage systems with adequate capacity to handle the anticipated discharge. All point source outlets discharging from the property receiving runoff from the new development shall be stabilized with an energy dissipation method such as preformed scour holes or riprap aprons designed in accordance with the requirements of the Connecticut Department of Transportation Drainage Manual, as amended.

Where level spreaders are proposed, calculations shall be submitted documenting that velocities do not exceed the erosive velocity of the existing soil type over the level spreader. The location of the point source is critical to avoid adverse impacts to property(ies) proximate to the site. Such point sources shall be located at a minimum of 10 feet inside the property line to allow for maintenance of the level spreader. Where infiltration facilities are proposed, they shall be located a minimum of 10 feet from the property line.

- g. **Maintenance and Operation.** Maintenance of all drainage facilities and systems constructed or modified as part of a proposed project, will be the responsibility

of the property owner, unless otherwise dedicated to or the acknowledged responsibility of a government agency.

Proposed Operation and Maintenance (“O&M”) plans and schedules must be submitted with the application. In general, the O&M plan for any such drainage facility or system shall provide for routine maintenance such as minor cleaning usually once or twice a year and insure that the drainage facility or system is unimpeded and operational. The O&M plan shall further provide that the drainage facility or system shall be inspected at least every two years by a professional engineer, with a copy of the inspection provided to the Planning and Zoning Commission. Inspections for sites and buildings with an even street number shall occur in even-numbered years, while inspections for those with an odd street number shall occur during odd-numbered years.

Upon approval by the Commission, the O&M plan shall be filed on the Land Records. Each O&M plan is to identify the specific drainage facilities or systems on the site, inspection methods and frequencies, and maintenance methods and frequencies.

- h. **Licensed Professional Engineer.** All Stormwater management plans, reports, calculations, and O&M plans and schedules shall be performed by, signed and sealed by a Professional Engineer licensed in the State of Connecticut.
- i. **Exceedance of Minimum Standards.** Applicants are encouraged to exceed the minimum drainage standards set forth in these regulations to increase positive impacts in flood prone areas.

882. Documentation Requirements

Stormwater management plans and reports where required in these Regulations, as defined in Section 880 shall include the following documentation:

- a. Separate topographic contour mapping showing the existing and proposed drainage areas at an appropriate scale.
- b. Floodplain boundaries and Stream Channel Encroachment Lines as defined by the National Flood Insurance Program and the Connecticut Department of Environmental Protection, respectively.
- c. Inventory and evaluation of on-site hydraulic structures and watercourses, within or related to areas of proposed impact, including brooks, channels, culverts, bridges, dams, weirs, and dikes, with information on their flow capacity and physical condition. The limiting capacity of existing structures may, at the option of the Director of Public Works, be used to establish the allowable post-development peak flow rate from the site.
- d. Inventory and evaluation of on-site stormwater storage areas, including impoundments, riverine corridors, swamps, ponds, wetlands, floodplains, and miscellaneous depressions.

- e. **Identification of peak rate of runoff under pre-development and post-development conditions from the site at each design point. An evaluation of the potential impact of the peak runoff from the site upon properties proximate to the site and downstream locations such that the site represents 10% or less of the total watershed area.**
- f. **Specific documentation in support of stormwater management design shall include, but is not limited to the following:**
 - (1) **Method used to calculate Stormwater runoff.**
 - (2) **Runoff characteristics of the property before and after development.**
 - (3) **Watershed calculations used to develop NRCS Curve Number or Rational Method Calculations.**
 - (4) **Time of concentration calculations identifying length and slope of various components including overland, shallow concentrated and channel flow. Time of concentration paths to be shown on the watershed maps.**
 - (5) **Hydrologic model input and output files for all storms evaluated.**
 - (6) **Subwatershed map delineating all contributing areas to each catch basin in a proposed storm sewer system.**
 - (7) **Hydraulic computations for all storm drainage systems. Computations shall show hydraulic grade line elevations and structure rim elevations.**
 - (8) **Pond and storage area stage-storage discharge calculations.**
 - (9) **Soils information, including depth to seasonally high groundwater and permeability testing and drawdown calculations for proposed infiltration systems, showing that the infiltration practice will drain within 24 hours.**
- g. **A complete set of construction plans. Where storm drains are proposed in roadways, the plans shall include storm sewer specifications and profiles.**
- h. **Applicants for non-single family residential developments shall submit a brief statement evaluating if applying Section 881(i) is prudent and feasible.**

883. Hydrologic Evaluation

Various methods are available for hydrologic modeling, with some methods more appropriate than others. Most methods are based upon land cover and time of concentration relationships. Hydrologic models should use methods established by the Soil Conservation Service (now Natural Resources Conservation Service) or the United States Army Corps of Engineers. In all cases, the 2, 10, 25, 50 and 100 year storms shall be evaluated for existing and proposed conditions comparative hydrology, with the

same modeling methodology used for both conditions. The Director of Public Works may waive the requirements herein if the applicant demonstrates, in writing, why a proposed alternate method of analysis is appropriate and adequate.

- a. **Basis of Existing Conditions Analysis.** Existing Conditions Analysis shall account for actual on-site conditions at the time of the proposal, accounting for all depressions, and types of land cover, except for applications involving the demolition of an existing residential dwelling or commercial building and replacement of the razed structure with a new structure.

Where an existing residential dwelling or commercial building is proposed to be razed and replaced with a new structure, the basis of existing conditions analysis shall be the site's undeveloped condition if there is no engineered detention system on the existing site. If there is an existing engineered detention system on the existing site, then the actual existing conditions at the time of application shall be used as the basis of the existing conditions analysis. The local land use board may require a comparison to undeveloped conditions where warranted.

- b. **Detention Analysis.** A complete runoff hydrograph evaluation is required for projects utilizing detention methods. Hydrograph evaluations shall be conducted for pre-development and post-development conditions for storms with return frequencies of 2, 10, 25, 50 and 100 years.
- c. **Time of Concentration.** Times of concentration used in all hydrology models shall be based upon the method outlined in the Connecticut Department of Transportation Drainage Manual, most recent version and addenda thereto.
- d. **Design Frequencies**

Facility	Design Frequency
Storm Drains	
Local Streets	25
Parking Lots	25
Collectors and Arterial Streets	25
Collector and Arterial Streets at Sags ¹	50
Drainage Channels and Ditches	25
Culverts ²	
Upstream watershed area < 1 square mile	50
Upstream watershed area > 1 square mile	100
Bridges	100
Detention Facilities	100

¹ Sags are defined as the lowest point in a vertical curve where water can only be removed through a storm system. The inlet at the sag shall be designed to accommodate a 50-year storm, while the remainder of the storm drainage system can be designed to accommodate the 25-year storm.

² Crossings of watercourses will require design for the 100-year storm, regardless of the size of the upstream watershed area. For those critical activities as defined in Section 25-68b through 25-68h, CGS, the design storm frequency shall be 500 years.

884. Peak Flow Attenuation

- a. The discharge of stormwater runoff from development sites shall not cause adverse impacts to properties proximate to the site or cause adverse impacts downstream from the site. In all cases, the applicant shall perform a watershed study to document that the proposed development will not cause or exacerbate flooding on properties proximate to, or downstream from the site. The limit of this study will be the downstream point at which the site represents 10% or less of the total watershed area. This study shall be done for the 2, 10, 25, 50 and 100 year storms.

885. Infiltration and Stormwater Quality

Infiltration shall be utilized where appropriate to reduce stormwater runoff rate and volume, to improve stormwater quality, and to recharge groundwater. Runoff from areas with high pollutant loadings, such as gasoline stations shall not be infiltrated. All infiltration practices shall be subject to pretreatment with another stormwater best management practice. The following runoff depths over the site impervious area shall be infiltrated where appropriate and feasible, unless waived by the Director of Public Works:

Hydrologic Group	Depth, Inches
A	0.40
B	0.25
C	0.10
D	No recharge requirement.

The following measures shall be applied on the development site to the maximum extent practicable:

- a. **Roof Runoff.** Roof runoff from non-metal roofs shall be directed into infiltration systems or onto stable vegetated soils for at least 50 feet where practicable to encourage infiltration and groundwater recharge. Excess roof runoff may be directed overland or to watercourses or storm drains by grass swales or perforated pipes.
- b. **Pavement Runoff.** Pavement of parking lots, driveways and similar areas shall be designed to encourage groundwater recharge via the use of infiltrative systems. Parking lots with heavy usage or near water supply sources shall include measures to eliminate to the extent practicable, and/or reduce the potential for groundwater contamination, including oil traps, sediment basins, vegetated filters, etc. prior to infiltration systems. The use of grass median strips and depressed islands are encouraged.
- c. **Driveway Runoff.** Where appropriate, residential driveways shall be graded to encourage sheet flow, non-point runoff flow onto pervious areas such as grass lawns and woodlands rather than directly to catch basins or drainage systems.

- d. **Sheet Flow.** Runoff shall be designed into sheet flow across natural or artificially vegetated areas where appropriate.
- e. **Total Suspended Solids.** Applicants shall submit calculations documenting the anticipated removal percentage of post-treatment total suspended solids with respect to the post-development conditions without stormwater treatment.

886. Stormwater Detention Facilities

Stormwater detention facilities to temporarily store excess runoff may be used to control peak flow rate and duration of downstream flows when coordinated with the runoff characteristics of the watershed in which they are located and the local site conditions.

- a. Any detention system, the failure of which may present a risk of significant damage or risk to life may be regulated as a dam by DEP pursuant to Sections 22a-401 through 22a-409 of the Connecticut General Statutes. The Town Public Works Director shall be copied on all correspondence.
- b. The stormwater released from a detention facility shall not cause, contribute to or exacerbate downstream flooding conditions.
- c. Detention ponds shall have a minimum freeboard of one foot for the 100-year storm.
- d. An O&M plan shall be prepared for every detention facility, identifying responsibilities and items of routine maintenance, and emergency operations in the event of a flood.
- e. Detention basins shall have an emergency discharge outlet with a capacity equal to the discharge from a 100-year frequency flood, with routing computations.
- f. Where proposed, the design of a detention pond shall be supported by the following information:
 - (1) Plan with a scale of not less than 1" = 40' showing proposed contours with a maximum 2-foot interval.
 - (2) Details of the outlet.
 - (3) Inflow hydrograph with outflow hydrograph superimposed upon it.
 - (4) Cross sections of embankment and spillway.
 - (5) Elevation-storage curve or table.
 - (6) Elevation – discharge curve or table.
 - (7) Flood routing calculations.

- (8) Evaluation of the subsurface conditions relative to water table, ledge and soil permeability.**
- (9) Materials to be used for construction.**
- (10) Methods employed to avoid outlet opening clogging.**
- (11) Proposed landscaping and vegetative measures used to stabilize slopes and bottom surfaces.**
- (12) Interior slopes shall not exceed a ratio of 3 horizontal to 1 vertical.**

887. Stormwater Conveyance Systems

- a. Natural systems, including perennial and intermittent streams, swales and drainage ditches, shall be maintained in an open condition to the maximum extent practicable.**
- b. Conveyance systems shall be designed to minimize changes in the runoff travel time through the use of overland flow, grass lined channels and surface depression storage.**
- c. Closed storm drainage systems involving storm drain pipes shall be designed to:**
 - (1) Have a minimum capacity for the 25- year frequency storm flow.**
 - (2) Utilize the appropriate Manning's roughness coefficient as prescribed by the Town Stormwater Management Manual as revised.**
 - (3) Have a minimum of 2 feet of cover or adequate cover and strength to support AASHTO HS-20 loading.**
 - (4) Keep the hydraulic grade line a minimum of one foot below the rim or grate elevation of the structure.**
- d. All storm drainage systems shall be designed and constructed to accommodate runoff from upstream contributing areas without causing an adverse impact on properties proximate to or downstream from the system.**

887A Culverts and Bridges

- a. The hydraulic analysis and design of culverts shall consider the orifice flow conditions at the inlet, the capacity of the pipe itself, and the depth of water at the outlet (tailwater). All flow conditions have to be analyzed to determine which condition is the most restrictive. Culverts and bridge openings shall be designed to provide a minimum freeboard of 1 foot as measured from the top of the design water surface elevation or top of culvert, whichever is greater, to the top of the embankment supporting the roadway.**

- b. 100-Year water surface elevations shall not be increased by more than one foot, or 0.1 feet on the Noroton River, nor allowed to cause damage or increased flooding to upstream properties.**
- c. Suitable headwalls or flared-end sections shall be provided at the open end of any pipe; wing type headwalls shall be provided at the open end of large pipe. Culverts under streets may be extended to the edge of the right-of-way of the street.**
- d. The location of new culverts or bridges shall minimize the relocation of watercourses.**
- e. Enclosing streams in culverts, other than road or driveway crossings, should be avoided so that natural stream corridors are maintained.**

887B. Catch Basins

- a. Catch basin spacing and type shall be determined by gutter flow design, and the need for future lot drainage. A drainage structure shall be placed at each grade change, horizontal direction change, and at the junction of two or more drains.**
- b. All catch basins within intersectional areas are to be located five (5) feet before all Points of Curvature (P.C.'s) and Points of Tangent (P.T.'s) along the curb alignment.**
- c. A complete "Gutter Flow Analysis" will be performed to determine catch basin spacing and type in roadway sags. Flooding shall not exceed one half of the lane width. The design procedures for gutter flow analysis outlined in the State of Connecticut Department of Transportation "Drainage Manual" latest edition shall be followed unless another method is approved by the Director of Public Works.**
- d. All catch basins shall have a sump to trap sediment. The sump shall be a minimum of 24-inches deep below the lowest pipe invert. Catch basin sumps must be watertight.**
- e. Catch basins subject to potentially high debris loads of floatable material shall be equipped with a hood or baffle to prevent discharge of floating material**

887C Open Channels

Land clearing and grading within a wetland or natural stream corridor should be avoided or minimized, except at stream crossings, so that streams remain in a natural state. Even where work is minimized, it may be subject to local, state and federal permitting requirements Care should be exercised to avoid, or minimize disturbance of riparian vegetation, including grasses, shrubs and trees in the stream corridor wetland, or along the watercourse.

- a. Type A open channels are classified as local drainage channels with a primary purpose of conveying urban, parking lot and road runoff from small watersheds, frequently with intermittent flow and limited ecological value and are intended to convey their design flow within their banks. They shall be designed in accordance with the following:**

 - (1) Freeboard allowances from the top of the design storm water surface elevation to the top of the channel of at least one foot shall be provided.**
 - (2) The use of impervious linings is discouraged, for situations where velocities warrant some form of protective lining, permanent turf reinforcement mats are encouraged.**
 - (3) Channel linings or vegetative measures shall be designed to protect channel perimeter for the peak flow of the design storm. Calculations shall be submitted in the storm water management report.**
- b. Type B open channels are classified as natural perennial watercourses or man-made channels planned to simulate a natural watercourse. They shall be designed in accordance with the following where appropriate:**

 - (1) Shall have a minimum flow capacity of a flood equal to at least 25 –year frequency flood;**
 - (2) Shall have water surface profiles prepared for the 2, 10, 25, 50 and 100- year frequency floods;**
 - (3) Shall be designed to minimize the need for artificial linings (concrete, rip rap, asphalt, etc.)**
 - (4) Shall encourage ecological productivity and variety;**
 - (5) Shall be visually compatible with its surroundings;**
 - (6) The alignment and slope shall be compatible with natural channels in similar site conditions;**
 - (7) Variations in width, depth, invert elevations, and side slopes are encouraged for aquatic and visual diversity;**
 - (8) Straightening channels and decreasing their length is discouraged;**
 - (9) The cross sections used to determine the channel and floodplain geometry for water surface profile computations shall be located upstream and downstream of hydraulic structures, at changes in bed slope or cross section shape, and generally at intervals of not more than ten times the width of the 100-year floodplain; and**

- a. Prior to obtaining final Planning and Zoning signoff on a project or a Zoning and Building Permit, an O&M plan shall be recorded on the Darien Land Records. The O&M plan shall stipulate the inspection frequency, maintenance requirements and intervals for all proposed Stormwater management practices on the site.**
- b. Prior to obtaining final Planning and Zoning signoff on a project or a Certificate of Zoning Compliance, a Connecticut licensed land surveyor shall prepare and submit an improvement location survey, depicting pipe inverts, diameters and sizes, as well as structure inverts and elevations and other information to adequately describe the constructed stormwater management system. The survey shall also indicate the extent of impervious surfaces; and topography of the completed site where changes in grade exceed one foot.**
- c. Prior to obtaining final Certificate of Occupancy on a project, a professional engineer shall certify that the proposed drainage system was installed in conformance with the approved plans.**